

German adjective agreement in GPSG*

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0. Summary

Determiners and adjectives in German agree with their head nouns in case, gender, and number. In addition, all adjectives have three paradigms of inflectional forms, which are traditionally called 'declensions': strong, weak, and mixed. Which declension an adjective occurs in depends on the determiner it combines with, a phenomenon traditionally called 'agreement'. Section 1 presents the main facts about adjective agreement in German, in a fairly theory-neutral fashion.

In a rich theory of syntax (like classical transformational grammar) it would be easy to write rules for German which have the right effects. My purpose here is to explore how to describe German adjective agreement in a distinctly lean theory of syntax, namely generalized phrase structure grammar (GPSG). Section 2 enumerates the principal features of GPSG, paying special attention to those that might figure in accounts of agreement.

Sections 3 and 4 attack the problem of the three adjective declensions. In section 3, several functional accounts of the distribution of forms are subjected to scrutiny and found wanting. In section 4, GPSG descriptions treating the phenomena as subcategorization are shown to be unsuitable, and those treating them as agreement are shown to be unavailable. The appropriate GPSG analysis involves government rather than agreement, a conclusion that leads to some general comments on the description of government in GPSG.

1. The facts

I begin with a reasonably precise, though unformalized, account of the relevant German facts.

The language has three grammatical genders (masculine, neuter, and feminine) and two grammatical numbers (singular and plural). Only four of the six combinations of gender and number are ever morphologically distinguished: MASC-SG, NEUT-SG, FEM-SG, PLURAL.

There are four grammatical cases: nominative (NOM), accusative (ACC), genitive (GEN), dative (DAT). These combine with the four gender/number possibilities to yield a paradigm with sixteen potentially distinct NP forms in it.

I now turn to a summary of the adjective declensions (section 1.1), the corresponding classes of determiners (1.2), and the declensions to which the determiners themselves belong (1.3), with a summary of these matters in section 1.4. Declensions of nouns are treated in section 1.5, where it is pointed out that the 'declensions' of nouns and determiners are lexical categorizations, whereas the 'declensions' of adjectives in German are imposed by constituents with which the adjective is in construction. Section 1.6 looks briefly again at the grammatical categories of gender, number, and case, in comparison to the declension categories. And section 1.7 summarizes the whole business.

1.1. The adjective declensions

German adjectives occur in three paradigms of forms:

- 'strong' forms, which occur with a zero determiner or with an invariable determiner like zwei 'two';
- 'weak' forms (with massive levelling of the distinctions marked in the strong forms), which occur with der 'the', dieser 'this', jener 'that', welcher 'which', and solcher 'such';
- 'mixed' forms (with some endings from each of the two other sets), which occur with ein 'one, a', kein 'no', and the possessive pronouns (mein 'my', unser 'our', and so on).

The strong forms can be seen in gut-er Mann 'good man' and gut-e Maenn-er 'good men' (here I have indicated morpheme breaks by a hyphen); the weak forms in dies-er gut-e Mann 'this good man' and dies-e gut-en Maenn-er 'these good men'; the mixed forms in kein gut-er Mann 'no good man' and kein-e gut-en Maenn-er 'no good men'.

The endings for the three sets are shown in Tables 1-3. Six of the sixteen case/gender/number combinations have the same endings in all three sets; these six are underlined in the tables. Notice that the mixed declension is indeed an amalgam of endings from the strong and weak declensions, though with the weak declension predominating: of the ten endings that differ in the strong and weak sets, the mixed set takes seven from the weak and three from the strong. With some justification, we might then consider the mixed declension as a special subtype of the weak declension. In what follows, I will call the strong declension 'Declension S', the weak declension 'Declension W', and the mixed declension 'Declension W-MX'.

CASE	MASC-SG	NEUT-SG	FEM-SG	PLURAL
NOM	-er	-es	-e	-e
ACC	-en	-es	-e	-e
GEN	-en	-en	-er	-er
DAT	-em	-em	-er	-en

Table 1. Strong adjective endings.

CASE	MASC-SG	NEUT-SG	FEM-SG	PLURAL
NOM	-e	-e	-e	-en
ACC	-en	-e	-e	-en
GEN	-en	-en	-en	-en
DAT	-en	-en	-en	-en

Table 2. Weak adjective endings.

CASE	MASC-SG	NEUT-SG	FEM-SG	PLURAL
NOM	-er	-es	-e	-en
ACC	-en	-es	-e	-en
GEN	-en	-en	-en	-en
DAT	-en	-en	-en	-en

Table 3. Mixed adjective endings.

1.2. The determiner classes

Several remarks should be made about this array of facts. First, the grouping of factors conditioning strong vs. weak vs. mixed adjective declension is not semantic, at least not on any account I can imagine. In particular, the determiners conditioning strong declension include both definites (like zwei) and indefinites (like the zero determiner and the exclamatory indeclinable determiner welch); the determiners conditioning weak declension also include both definites (like der) and indefinites (like welcher); and the determiners conditioning mixed declension also include both definites (like mein) and indefinites (like ein). That is, it appears that the division of determiners

into three classes is a grammatical, and not a semantic, classification. The three classes might as well be named 'Class I', 'Class II', and 'Class III'--and, indeed, in what follows I will use this nomenclature.

1.3. The determiner declensions

Next, two of the three classes of determiners are declinable, and for each class there is a single declension type. The endings for Class II determiners are shown in Table 4, those for Class III determiners in Table 5. Notice that the endings for Class II determiners are almost identical to those conditioned by Class I determiners--only the masculine and neuter genitive singular endings (both -es)¹ differ--and that the endings for Class III determiners are closer to the adjective declension conditioned by Class I determiners than to either of the others (the Class III determiners share eleven of their sixteen endings with adjectives conditioned by Class I determiners, and only four endings with adjectives conditioned by Class II or Class III determiners).

1.4. Summary of the data so far

To sharpen, and abbreviate, the observations of the previous paragraph: Class I determiners are indeclinable; Class II determiners belong to a subtype, call it 'Declension S-ES', of Declension S (with a special ending -es in the masculine and neuter genitive singular); Class III determiners belong to a subtype, call it 'Declension S-ES-Z', of Declension S-ES (with zero endings in the masculine and neuter nominative singular and the neuter accusative singular, as well as the special ending -es in the masculine and neuter genitive singular). In other words, though determiners of Classes II and III condition adjectives of Declensions W and W-MX, respectively, the determiners themselves belong to (subtypes of) Declension S.

<u>CASE</u>	<u>MASC-SG</u>	<u>NEUT-SG</u>	<u>FEM-SG</u>	<u>PLURAL</u>
<u>NOM</u>	-er	-es	-e	-e
<u>ACC</u>	-en	-es	-e	-e
<u>GEN</u>	-es	-es	-er	-er
<u>DAT</u>	-em	-em	-er	-en

Table 4. Declension of Class II determiners.²

CASE	MASC-SG	NEUT-SG	FEM-SG	PLURAL
NOM	zero	zero	-e	-e
ACC	-en	zero	-e	-e
GEN	-es	-es	-er	-er
DAT	-em	-em	-er	-en

Table 5. Declension of Class III determiners.

1.5. The noun declensions

A final complexity is that nouns also have several declensional patterns, also traditionally described in terms of 'strong', 'weak', and 'mixed' types (as in Curme 1960: 70-94). The strong noun declension is summarized in Table 6, the weak in Table 7, and the mixed in Table 8.

The strong declension has one of three plural markers, indicated by PL in Table 6: -e, with a zero allomorph, as in Arm-e 'arms' and Engel 'angels'; -e, also with a zero allomorph, accompanied by umlaut in the base, as in Soehn-e 'sons' and Brüder 'brothers'; and -er accompanied by umlaut in the base, as in Büch-er 'books'.³

The weak declension (which contains no neuter nouns) has -en throughout the plural.

The mixed noun declension can be seen simply as a type of strong declension with -en as the plural marker, and I will do so here. One further type of noun declension, used especially for foreign borrowings like der Domino 'domino'--with -s in the genitive singular of masculine and neuter nouns and throughout the plural, and zero endings otherwise--is also clearly a subtype of the strong declension. Consequently, I opt for an analysis with only two declension classes for nouns, Declension S (strong) and Declension W (weak).

What is important here is that nouns, like determiners but unlike adjectives, are individually (and essentially arbitrarily) assigned to particular declension classes. Mann 'man' belongs to the strong declension (of the subtype with umlauted -er plurals), but Knabe 'boy' belongs to the weak declension. Declension class is a lexical property of particular nouns and determiners; adjectives, however, belong to no declension class lexically, but are assigned to a class by virtue of the type of determiner with which they are in construction. The declension class of the noun with which an adjective is in construction plays almost no role (but see Durrell 1979: 71) in determining the declension class of an

adjective: dies-er gut-e Mann 'this good man' has a weak adjectival form occurring with a noun belonging to the strong declension; gut-er Mann 'good man' has a strong adjectival form with the same noun; dies-er gut-e Knabe 'this good boy' has a weak adjectival form occurring with a noun belonging to the weak declension; and gut-er Knabe 'good boy' has a strong adjectival form occurring with the same noun.

1.6. Other grammatical categories

Gender, like declension class, is a lexical property of particular nouns; nothing predicts that Arm 'arm' is masculine and Hand 'hand' feminine. The gender classification of both adjectives and determiners is determined by the gender of the noun with which they are in construction: dies-er Arm 'this arm' and gut-er Arm 'good arm', dies-es Buch 'this book' and gut-es Buch 'good book', dies-e Hand 'this hand' and gut-e Hand 'good hand'.

The remaining grammatical categories that play a role in German adjective inflection, number and case, are in general not lexical properties of any word class. However, a determiner, adjective, and noun in construction with one another must agree in both number and case. Case is, of course, a property of whole noun phrases, determined by the syntactic context in which they occur. I will assume that number is also a property of whole noun phrases, one that is 'freely chosen' rather than determined by context.

1.7. Summary of the facts

--Declension is a lexical property of nouns and determiners, but not adjectives; nouns are essentially either Declension S (strong) or Declension W (weak), and determiners either belong to a subtype of Declension S or are indeclinable;

--Determiners are lexically (and arbitrarily) assigned to Class I, Class II, or Class III;

--The declension of an adjective is determined by the class of the determiner with which it is in construction (Declension S for a determiner of Class I, Declension W for a determiner of Class II, and Declension W-MX for a determiner of Class III);

--Gender is a lexical property of nouns, but not of determiners or adjectives;

--The gender of a determiner or adjective is determined by the gender of the noun with which it is in construction;

--Case and number are assigned to noun phrases as wholes;

--And the case and number of an NP must be duplicated as properties of the determiner, adjective, and noun within that NP.

<u>CASE</u>	<u>MASC-SG</u>	<u>NEUT-SG</u>	<u>FEM-SG</u>	<u>PLURAL</u>
<u>NOM</u>	zero	zero	zero	-PL
<u>ACC</u>	zero	zero	zero	-PL
<u>GEN</u>	-(e)s	-(e)s	zero	-PL
<u>DAT</u>	-(e)	-(e)	zero	-PL-n

Table 6. Strong noun declension.

<u>CASE</u>	<u>MASC-SG</u>	<u>FEM-SG</u>	<u>PLURAL</u>
<u>NOM</u>	zero	zero	-en
<u>ACC</u>	-en	zero	-en
<u>GEN</u>	-en	zero	-en
<u>DAT</u>	-en	zero	-en

Table 7. Weak noun declension.

<u>CASE</u>	<u>MASC-SG</u>	<u>NEUT-SG</u>	<u>PLURAL</u>
<u>NOM</u>	zero	zero	-en
<u>ACC</u>	zero	zero	-en
<u>GEN</u>	-(e)s	-(e)s	-en
<u>DAT</u>	-(e)	-(e)	-en

Table 8. Mixed noun declension.

2. Generalized phrase structure grammar

Given the above facts about the occurrence of certain inflected forms in German, my task is now to turn this relatively theory-neutral account into at least a sketch of a precise description. There are a number of theoretical

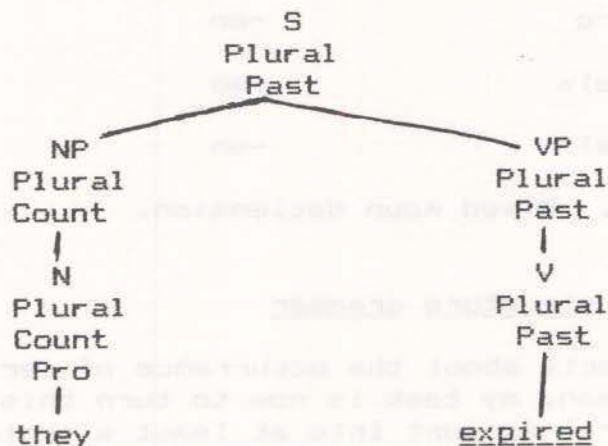
frameworks in which such a description could be couched. Transformational grammar in its many varieties, for instance, easily permits rules to be stated which will require one node in a syntactic structure to bear certain features on the basis of the features borne by other nodes.

However, for my exposition I have chosen the theoretical framework of generalized phrase structure grammar (GPSG), especially as developed by Gazdar and Pullum (1982; hereafter GP), because the framework is highly constrained, both in an exact technical sense and also in a looser sense. The describable sets of strings in GPSG (as defined by GP) are all context-free languages; that is the technical sense in which GPSG is a restricted framework. Independently of its restriction to context-free languages, GPSG attempts to place universal restrictions on the sorts of syntactic rules languages can have, and consequently on the set of possible languages; that is the loose sense in which GPSG is a restricted framework. (What makes it loose is that restricting the set of grammars does not necessarily restrict the set of languages generated, as Wasow (1978) has emphasized.)

In the remainder of this section, I describe the central features of GPSG. Some of these are shared with other current syntactic theories, others are especially characteristic of GPSG. Most have some bearing on the description of German adjective agreement.

2.1. Context-free rules

GPSG requires that all syntactic rules be context-free. That is, every syntactic rule in a language describes a possible branching, of a 'mother' category into a set of 'daughter' categories, in constituent structures in that language. A full constituent structure is consistent with the grammar if all the branchings in it are described by rules for that language. To say that



is a constituent structure of English is to say that each of the three branchings in this constituent structure--Plural Past S branching into a Plural Count NP and a Plural Past VP, Plural Count NP branching into a Plural Count Pro N, and Plural Past VP branching into Plural Past V--are licensed by the syntactic rules of English, and that the lexicon of English includes they as a Plural Count Pro N and expired as a Plural Past V.

2.2. Decomposition of categories

In common with virtually all current syntactic theories derived from, or framed in response to, classical transformational grammar, GPSG decomposes categories into sets of properties. Thus, a category like NP is decomposed into two components, one indicating that it is a noun-type, or nominal, category, the other indicating that it is a 'two-bar', or phrasal, category; this decomposition can be represented by the following notation, which has the spirit of GP's proposals, while differing from it in details:

{CAT:N, BAR:2}.

In the same vein a Plural Count NP would get a representation like

{CAT:N, BAR:2, NUM:+, CNT:+}.

In such representations, a property like CAT:N is actually a pairing of an attribute, here CAT, and a value, here N.

The version of GPSG given by GP treats categories as complexes of properties, with internal structure. In particular, there are significant subtypes of properties within a category. GP distinguish (a) 'head' properties (they call them 'head features'), (b) 'foot' properties (they call them 'foot features'), and (c) properties that are neither head nor foot properties; within the set of head properties, they distinguish (a1) 'agreement' head properties from (a2) all other head properties; within the set of foot properties, they in effect distinguish between (b1) foot properties (like reflexivity and wh-ness) that occur in lexical entries and (b2) the special 'slash' foot property, which is used in GPSG analyses of constructions with gaps in them. These distinctions in nomenclature correspond to different sorts of conditions on the occurrence of properties in branchings, but for the moment let me simply stipulate that it is necessary to refer to two subsets of the properties within a category, and also to refer in turn to a subset of one of these.

To represent this categorial substructure, I will follow GP in treating HEAD, FOOT, AGR, and SLASH themselves as attributes, taking sets of properties--that is, categories--as values. An example will clarify the proposal. I will suppose that number and case are head

properties, whose attributes are NUM and CASE, respectively; that number and case are agreement properties; that reflexive constituents belong to a category having a foot property with the attribute REFL; and that CAT and BAR are attributes of properties that are neither head nor foot properties. Given all of these assumptions, the representation of an accusative plural reflexive NP would be

{CAT:N, BAR:2, HEAD:{AGR:{NUM:+, CASE:ACC}}, FOOT:{REFL:+}}.
Similarly, a plural clause with an NP 'hole' in it would have a representation like

{CAT:V, BAR:3, HEAD:{AGR:{NUM:+}}, FOOT:{SLASH:{CAT:N, BAR:2}}}.

2.3. Metagrammars

An obvious stumbling-block lies in the path of anyone who maintains that a grammar for a language is nothing but a set of context-free rules describing possible branchings in that language: The number of such rules, in any language, is huge; and in any case merely enumerating this gigantic list utterly fails to express any generalizations about constituent structures.

GPSG's response to this objection is to generate rather than list the rules. Since each context-free rule is a description of an elementary piece of constituent structure, generalizations about constituent structures can be stated as generalizations about the set of rules, in a 'metagrammar' that describes the content of the grammar itself. The principles in this metagrammar might be of many types--some universal, some language-particular; some summarizing sets of rules in a single formula, some deriving sets of rules from a rule prototype, some predicting the existence of sets of rules on the basis of the existence of other sets--but most of these details need not concern us here. What is important is that the general program, of describing a large set of context-free rules in terms of general principles, is at least plausible.

Certain features of this program are important to us, however. These are treated in the next two subsections.

2.4. Free instantiation, implications, and defaults

One important issue for us is how to describe conditions on the co-occurrence of properties within categories. Consider, as an example, how to describe the fact that in German it is generally the case that the number of an NP can be 'freely chosen'--that is, does not depend on the number of neighboring constituents. The apparent difficulty is that essentially every time we want to state a rule introducing NP, we must state two rules, one to introduce Singular NP and one to introduce Plural NP. A generalization is being missed.

One solution to the problem is to state a prototype rule that does not mention number but merely introduces NP, and to let the values of the NUM property be 'freely instantiated'. Every such prototype rule then acts as an abbreviation for two rules, one mentioning the property NUM:- and one mentioning the property NUM:+. In general, we can suppose that

Property values are freely instantiated, except where this would be contradicted by some other principle of the metagrammar.

The very opposite sort of situation also occurs, of course. In such cases, the range of values for some property is completely determined by other property values within the same category. For instance, in section 1.5 above we remarked in passing that there are no neuter nouns with the weak declension; that is, a noun with the weak declension is either masculine or feminine. The sort of general principle we need to state here happens to be language-particular, but what is important is that it is implicational in form: if N has the property DECL:W, then N also has the property GEND:M or GEND:F. Thus,

The metagrammar includes principles predicting the range of values for one property on the basis of the values of other properties within the same category.

In some cases the relationship between properties within a category is not implicational (in the sense that one set of properties requires another), but 'nearly implicational' (in the sense that one set of properties is usually associated with another).

An instance of this latter relationship in German concerns the grammatical case of the direct object of a verb: There are verbs that require their direct objects to have dative case (äbneln 'resemble', for instance), and verbs that require their direct objects to have genitive case (genesen 'be delivered of, give birth to', for instance), but nearly all verbs require (or permit) their direct objects to have accusative case. We cannot say that if an NP is the direct object of a verb, then it is accusative--but we can say that if an NP is the direct object of a verb, then in the absence of further information we expect it to have accusative case. Accusative case is the default assignment of case to direct objects in German. In general, then, we want to be able to say that

The metagrammar includes principles that assign a certain value to some property within a category in the absence of some other principle assigning a value to that property in that category.

My example happens to be specific to German, but universal default assignments are also possible. For instance, I will assume that the default value for any foot property is -; the German lexicon must provide the information that the determiner welcher has the foot property WH:+, and the English lexicon must do the same for the determiner which, but neither lexicon has to specify that dieser or unser (in German) or this or our (in English) has the foot property WH:-.

2.5. Principles governing property agreement

The reason we want to distinguish head properties from foot properties, and agreement head properties from other head properties, is that principles can be formulated that govern the way in which each type of property can occur in branchings. A significant claim made by GP is that much of the content of these principles is universal rather than language-particular; I will comment on this aspect of feature-agreement in the next section.

Given the GPSG proposal that rules describe nothing more than a mother category and its daughter categories, there can be only two types of conditions on the co-occurrence of properties between constituents: those relating the properties in the mother category and the properties in (one or more) daughter categories; and those relating the properties in two (or more) daughter categories under the same mother. GP suggest conditions of both types.

Conditions on the co-occurrence of properties could take many forms, of course. As it happens, the three conditions proposed by GP are all positive, rather than negative, and (in combination with assumptions about free instantiation, implications, and defaults) they all have the effect of requiring that certain properties agree, that is, have the same values. Two of the conditions, the Head Feature Convention and the Foot Feature Principle, govern mother-daughter property agreement; the remaining condition, the Control Agreement Principle, governs property agreement between certain pairs of sisters.⁴

The Head Feature Convention (HFC) ensures that the head properties in a mother category and the head properties in the daughter category that is the head of the construction are identical. Assuming that the internal structure of a German (or, for that matter, English) NP involves the branching of NP into Det and Nom, Nom into AP and N, AP into A', and A' into A, then the HFC ensures that the head properties in the following pairs of categories are identical: NP and Nom, Nom and N, AP and A', A' and A. Rather more precisely, given a rule prototype that licenses the branching of

{CAT:N, BAR:2}

into the daughters

{CAT:Det, BAR:0} {CAT:N, BAR:1},

the HFC permits the branching of

{CAT:N, BAR:2, HEAD:{AGR:{NUM:+, GEND:F}}}

into the daughters

{CAT:Det, BAR:0} {CAT:N, BAR:1, HEAD:{AGR:{NUM:+, GEND:F}}}

but does not permit the branching of

{CAT:N, BAR:2, HEAD:{AGR:{NUM:+, GEND:F}}}

into the daughters

{CAT:Det, BAR:0} {CAT:N, BAR:1, HEAD:{AGR:{NUM:-, GEND:M}}}.

Here, the HFC requires identity of the head properties in NP and Nom; similar statements can be made for Nom and N, AP and A', and A' and A.

The Control Agreement Principle (CAP) interacts with the HFC to describe grammatical agreement in languages. Given a list of what I will call agreement pairs, certain pairs of sister categories, the CAP has the effect of ensuring that the two sister categories in a pair have the same agreement head properties. The list of agreement pairs--for the moment we do not have to be concerned here with where this list comes from--includes NP and VP, Det and Nom, AP and N. Then, given the branching (just above) of

{CAT:N, BAR:2, HEAD:{AGR:{NUM:+, GEND:F}}}

into

{CAT:Det, BAR:0} {CAT:N, BAR:1, HEAD:{AGR:{NUM:+, GEND:F}}},

the CAP requires that the properties in Det fill out to

{CAT:Det, BAR:0, HEAD:{AGR:{NUM:+, GEND:F}}}.

In German, the HFC and CAP together ensure that determiners, adjectives and nouns in construction with one another have the same values for the properties of number, case, and gender. Speaking very loosely, gender markings 'originate with' the lexical item N, while number and case markings 'originate with' the NP node dominating the whole business. The HFC requires that the gender marking on N be duplicated on Nom and then on NP; the CAP requires that the gender marking on Nom be duplicated on Det; the CAP also requires that the gender marking on N be duplicated on AP; and the HFC ultimately requires that the gender marking on AP be duplicated on A. As for case and number, the HFC requires that their markings on NP be duplicated on Nom and then N, and the CAP and HFC, as before, require that these markings be reproduced ultimately on Det and A.

The third agreement principle, the Foot Feature Principle (FFP), requires that a mother category possess every foot property appearing in any one of its daughter categories. In GP's treatment, the FFP acts as a constraint on the free instantiation of foot properties, and only as such a constraint; it does not 'propagate' properties appearing in categories by virtue of rule or metarule application.

2.6. Universal aspects of property-agreement principles

GP assume that all the content of the HFC, FFP, and CAP is universal. What is potentially particular to a given language, on this view, is the list of head properties; the specification of which daughter constituent is the head of a construction; the list of foot properties; the list of agreement head properties; and the list of agreement pairs.

In fact, GP entertain two further restrictions on language-particular variation. First, they observe that X-bar syntax generally assumes some universal principle (referring to category membership and bar level) that picks out the head constituent (if there is one). Their own proposal takes a somewhat different tack, marking heads explicitly but then using the HFC to predict their category membership. In any event, it seems clear that selecting the head and assigning it category membership are not independent operations.

Second, GP propose that the list of agreement pairs be universally determined. Indeed, they propose (building on ideas in Keenan 1974) that the list can be derived from the semantic principles associated with syntactic branchings; their statement of the CAP requires that two syntactic constituents standing semantically in a 'controller'-'controllee' (roughly, argument-functor) relationship have the same agreement head properties. I will not explore this proposal here. It is sufficient to observe that on any reasonable interpretation, the CAP will require that German nouns and their accompanying adjectives and determiners all have the same agreement head properties.

If universal versions of the HFC and the CAP are to 'provide the basis for a highly effective theory of agreement' (GP, 31), then the interaction of these two principles must be the only source of systematic agreement in head properties between two categories neither of which dominates the other; in particular, the CAP must be the only source of systematic agreement in head properties between two sister categories. The GP proposal for agreement would be completely undercut if there could be language-particular (meta)rules requiring identity of properties between sister categories. There is already genuine variation from language to language as to which properties are agreement properties, including the possibility that the set of agreement properties is empty. If languages with an empty set of agreement properties could nevertheless have idiosyncratic agreement rules, then there would be no pattern of property agreement or disagreement that could not be given a description; the CAP would not constrain grammatical theory at all. We appear to need something like the following Property Agreement Restriction (PAR):

No language-particular (meta)rule requires agreement in one or more properties between two sister constituents.

One further aspect of GP's treatment of agreement needs amendment here. GP do not constrain the set of head (or foot) properties in any way, but it was surely not their intention to suggest that each language could select its own set of head properties to function in the HFC and CAP and its own set of foot properties to function in the FFP. Rather, universal grammar should permit only a finite number of such properties; indeed, universal grammar should provide finite lists of the properties available for service in any particular grammar, a Universal Head Property List (UHPL) and a Universal Foot Property List (UFPL). The attributes on the UHPL correspond to the familiar grammatical categories of person, number, gender, definiteness, case, tense, aspect, voice, mood, negation, and the like. The attributes on the UFPL include at least WH, REFL, and SLASH.

In referring to properties like NUM:+, GEND:F, and WH:-, I am insisting that the properties on the UHPL and UFPL are not mere formal counters (not just the names 'NUM:+', 'GEND:F', and so on), that they have some substance. In particular, I require that every property on the lists have semantic concomitants. I am not maintaining here that these properties are to be identified with semantic features; grammatical categories are virtually always arbitrarily distributed in the lexicon to some extent. I am maintaining that head and foot properties are never fully arbitrary and language-particular categorizations of words and phrases; if they could be, then there would be no point in having a UHPL and UFPL. Fully arbitrary and language-particular categorizations of words are indeed possible--declension classes of nouns and conjugation classes of verbs are clearly like this in some languages--but, assuming the UHPL and UFPL, lexical properties of this sort cannot be either head or foot properties and so cannot be subject to the HFC, CAP, or FFP; and, assuming the PAR, they cannot be subject to language-particular agreement (meta)rules either. These parochial properties are not subject to any sort of agreement principles.

To summarize: Parochial properties play no role in any sort of agreement relationships, and are not drawn from a substantive universal list. In contrast, agreement properties are distributed via the HFC and CAP, and since they are head properties, they must be chosen from a universal list and cannot be invented afresh for each language.

2.7. Two distinct types of 'agreement'

The CAP is designed to cover only phenomena of grammatical agreement, in a narrow sense. It provides no account of agreement between anaphoric elements and their antecedents, as when it is said that the pronoun er agrees with its antecedent der Mann in the sentence Der Mann sagt, dass er krank ist 'The man says that he is sick'. Anaphor-antecedent agreement in GPSG needs a different sort of account from the one the theory makes available for describing (for instance) the agreement in gender and number between the article der and the noun Mann in this example. The analysis of anaphor-antecedent agreement will be closely tied to rules of semantic interpretation, perhaps via a general principle like Lapointe's (1983: 125) Well-formedness Condition on S-structures, which says that 'If two word-level categories in a S-structure are logically connected, then they must agree on whatever non-semantic morphological features they share'.⁵

2.8. Lexical subcategorization by rule index

Just as they refrain from attempting a uniform semantic account of agreement, choosing instead to describe some facts entirely via syntactic rules and others in part by reference to semantic interpretation, so GP reject thoroughly semantic accounts for the subcategorization of lexical items with respect to the set of sister categories they can combine with. Instead, they argue that at least some subcategorization facts require a syntactic treatment.

They propose assigning each phrase structure rule an index and letting this index be represented as a property in any lexical category introduced by the rule. If, for instance, rule 6 expands NP as Det Nom, then the Det introduced by the rule will have the index 6 represented as one of its properties. And any determiner that can combine with a Nom will have the index 61 represented as one of its properties in the lexicon.

2.9. Other features of GPSG

The remaining characteristic features of GPSG do not play a central role in my discussion of German adjective agreement. I mention them here for completeness.

The first of these (already mentioned above) is the use of a foot property with the attribute SLASH to describe gap-filler dependencies, for instance the dependency between a gap within a relative clause and the relative pronoun that serves as its filler.

Next is the 'IDL' format', which allows grammars to be framed in a way that separates principles describing constituency (immediate dominance) from those describing the linear ordering of constituents.

Finally, there is the rule-to-rule semantics of GPSG, the assumption that a rule comprises both a syntactic part (specifying a permissible branching into constituents) and a semantic part (a function specifying a semantic interpretation for the whole construct, given as arguments the semantic interpretations of those constituents). On this assumption, two rules are distinct, and so get distinct indices, if either their syntactic parts or their semantic parts are distinct.

3. Analyzing the declensions: functional proposals

The GPSG framework of section 2 permits a satisfactory description of many details about the forms that German prenominal adjectives take. In particular, agreement with respect to case, gender, and number (CGN) has already been sketched within this framework. What remains is an account of the strong, weak, and mixed adjective (S, W, and W-MX) declensions as they relate to subtypes of determiners (I, II, and III).

Sections 3.2 through 3.5 examine a series of 'functional' proposals, all versions of the idea (presented in section 3.1) that the relationship between determiner subtypes and adjective declensions follows from a general principle requiring characteristic--unambiguous and nonredundant--exponents of the morphosyntactic categories CGN. I am unable to concoct any adequate formulation of this proposal.

Section 3.6 points out that such a constraint would be both transderivational and (in part) phonological, therefore not available in GPSG rules in any case. However, it would be expressible in a surface filter, rather than in a rule of syntax, assuming that surface filters apply to morphophonological representations. Even this last (GPSG-acceptable) treatment, I argue, is inadequate. Syntactic rules must relate determiner subtypes and adjective declensions, and rules of allomorphy that are adequate for German (sketched in section 3.7) do not refer to functional notions like ambiguity and redundancy and do not even have to refer to the phonological form of endings.

3.0. Property values and conventional references to them

In the interests of making it possible to formulate at least a few rules explicitly, I digress here on formal

matters. Some readers might want to skip to the main body of the exposition in section 3.1.

In the remainder of this paper, for the sake of brevity and clarity I will use 'NOM', 'ACC', 'GEN', and 'DAT' to refer to the four cases of German; 'FEM', 'MASC', and 'NEUT' to refer to the three genders; 'SG' and 'PL' to refer to the two numbers; 'I', 'II', and 'III' to refer to the three determiner classes; and 'S', 'S-ES', 'S-ES-Z', 'W', and 'W-MX' to refer to the declension classes of adjectives and determiners. These are all to be understood as standing for property values, some of which were presented as simple in section 2 but are in fact best treated as complex.

For instance, I assume (following Bierwisch 1967) that the attribute CASE takes as its value a set of two properties, with bivalent attributes OBL (for the oblique cases, genitive and dative, versus the direct cases, nominative and accusative) and GOV (for the necessarily governed, or object, cases, accusative and dative, versus the ungoverned, or subject, cases, nominative and genitive). A reference to 'DAT' is then a reference to {OBL:+, GOV:+} as a value for CASE. I also assume (again following Bierwisch) that the attribute GEND takes as its value a set of two properties, with bivalent attributes F (for the feminine gender as against the masculine and neuter) and M (for the masculine gender as against the feminine and neuter). A reference to 'FEM' is then a reference to {F:+, M:-} as a value for GEND. And of course, 'SG' and 'PL' are references to - and +, respectively, as values for NUM.

Similar decompositions are needed for the properties of determiner class and adjective/determiner declension. Without defending these choices, I enumerate the properties I will be referring to below. The bivalent attribute INDC separates indeclinables (in particular, Class I determiners) from declinable modifiers (Class II and III determiners, and all adjectives). The bivalent attribute EIN separates the 'ein words' (the Class III determiners) from the 'der words' (the Class II determiners). The attribute DECL takes as its value a set of two properties, with bivalent attributes WK (for the weak and mixed declensions versus the strong declension) and MX (for the mixed versus the weak declension). As a result of these decisions, a reference to 'W-MX' is a reference to {WK:+, MX:+} as a value for DECL, and a reference to 'III' is a reference to - as a value for INDC in combination with + as a value for EIN.

3.1. The characteristic-exponent proposal

Faced with the complex details of agreement in German prenominal adjectives, some linguists--and language teachers--have sought a functional account of the facts. In particular, it has repeatedly been suggested that what lies

behind the principles of adjective declension is the general condition that each CGN combination should have its own characteristic exponent at some point within an NP. On this proposal, the function of inflection (whether of a noun, a determiner, or an adjective) is to convey information about the morphosyntactic categories of the NP (cf. Durrell 1979: 71f.), and in the ideal case this information is conveyed both unambiguously and nonredundantly.

The characteristic-exponent proposal is sometimes presented to language learners via useful hints about how to remember the details of the adjective declensions, as in the following passages from an outline grammar of German, Eltzner and Radenhausen (1930):

Weak Declension of Adjectives.--When an adjective is preceded by a der word, the case endings of the der word shows the gender, number, and case of the noun modified. The adjective, therefore, does not repeat these endings; it takes only the endings -e or -en. (p. 22)

[Mixed Declension of Adjectives] When an adjective follows an ein word which lacks a case ending, the adjective supplies the ending...When the ein word has the characteristic case ending, the adjective has the weak ending... (p. 23)

The key word in the first quotation is therefore; adjectives, it is implicitly claimed, have distinctive endings only when these are not redundant expressions of CGN. Thus, klein 'little' in der kleine Mann 'the little man' takes the nondescript form kleine because the determiner der already indicates the CGN values NOM SG MASC. The key word in the second quotation is supplies; NPs, it is implicitly claimed, must have unambiguous indications of their CGN, and if these are not supplied by the determiner, they must be supplied by the adjective. Thus, klein in ein kleiner Mann 'a little man' has the strong form kleiner because this indicates the NOM (vs. ACC) and MASC (vs. NEUT) values not unambiguously supplied by the determiner ein.

3.2. The unadorned proposal

There are a number of complexities in turning these useful hints into a putative rule in the grammar of German. One was introduced in section 1.5 above: Head nouns bear (some) marks of case and number, and so can contribute something to the pool of CGN marks within an NP. Durrell (1979: 83) points out that noun forms can 'resolve ambiguities in the paradigm of the definite article', in cases like der Beamte 'the official' (NOM SG) vs. der Beamten 'the officials' (GEN PL) and die Fremde 'the (female) stranger' (NOM/ACC SG) vs. die Fremden 'the strangers' (NOM/ACC PL). We must decide whether a functionally based

rule treats the entire NP 'as a morphological prime' (Durrell 1979: 82) or whether it takes only determiners and adjectives into account (as seems to be suggested in the Eltzner and Radenhausen quotations above).

Putting this issue aside for a moment, I observe that the simplest formulation of the characteristic-exponent proposal, (I) below, is obviously wrong.

- (I) (a) A German NP A with CGN values I must contain inflectional material M making A unambiguously an exponent of I; that is, M must be phonologically distinct from the inflectional material in any NP with CGN values different from I.
- (b) In addition, M must be a nonredundant exponent of I; that is, removing any of the inflected words in A must yield an A' that is phonologically identical to an NP with CGN values different from I.

A great many German NPs are ambiguous in the sense of (Ia), and some unambiguous NPs are redundant in the sense of (Ib). The NP Frauen 'women', for instance, is completely ambiguous as to its case, being either NOM, ACC, GEN, or DAT. And the NP den Buechern 'the books' (DAT) is unambiguous but redundant, since removing the determiner den yields an NP, Buechern, that is unambiguously DAT PL (its plurality indicated by umlaut and the suffix -er, its dative case indicated by the final suffix -n).

3.3. First restriction

Perhaps the conditions affect not all NPs, but only those with prenominal adjectives:

- (II) (a) A German NP A having CGN values I and containing a prenominal adjective must contain inflectional material M making A unambiguously an exponent of I.
- (b) In addition, M must be a nonredundant exponent of I.

But (II) will not do either. NPs like das grosse Buch 'the large book' (NOM or ACC), die kluge Frau 'the wise woman' (NOM or ACC), and einer kluger Frau 'a wise woman' (GEN or DAT) are all ambiguous as to case, and no inflectional affix carries the information that des grossen Buch(e)s 'the large book' (GEN) is NEUT rather than MASC, or that einem grossen Tisch 'a large table' (DAT) is MASC rather than NEUT. Moreover, the NPs grossen Buechern 'large books' and den grossen Buechern 'the large books' are redundant, since removing either the determiner den or the adjective grossen yields the unambiguous Buechern again.

3.4. Two further restrictions

Two amendments now suggest themselves, one for (IIa), the other for (IIb). The counterexamples I advanced to (IIa) involved CGN distinctions that are never indicated by inflectional material within an NP: NOM and ACC are always identical in form in the NEUT and FEM SG and throughout the PL; GEN and DAT are always identical in the FEM SG; and MASC and NEUT are always identical in the GEN and DAT SG. Consequently, one might revise (IIa) along the following lines:

- (III) (a) A German NP A having CGN values I and containing a prenominal adjective must contain inflectional material M sufficient to make A phonologically distinct from any NP having CGN values I', where I and I' are different CGN values that receive phonologically distinct exponents for at least one form class of German.

For (Ib) and (IIb), my counterexamples involved CGN values that were unambiguously indicated by noun inflection: Buechern can only be DAT PL. Consequently, one might revise (IIb) so as to focus on prenominal material only, along the following (somewhat hazy) lines:

- (III) (b) In addition, inflectional affixes on a prenominal adjective must not supply information about I already supplied by those on a determiner.

One might have thought that by making the characteristic-exponent conditions so astoundingly particular--by now, they are generalizations over very small finite collections of relevant data--I would have succeeded in protecting them from counterexamples. But no. The NP den grossen Flicker 'the large patch(es)', which is either ACC SG or DAT PL (the MASC noun Flicker 'patch' being phonologically unaffected by shifts in case and number), serves as a counterexample to (IIIa). And the NP eine kluge Frau 'a wise woman' (NOM/ACC SG FEM) serves as a counterexample to (IIIb), because both the determiner eine and the mixed-declension adjective kluge distinguish the NOM/ACC SG FEM from all other CGN values: the indefinite article eine has no PL forms, and it has the ending -e in the SG only in the NOM/ACC FEM (see Table 4 in section 1.3); and the mixed declension of adjectives has -e only in the NOM/ACC FEM SG (see Table 3 in section 1.1).

3.5. A final round of restrictions

I believe that the characteristic-exponent proposal cannot be made to cover the facts for all three declensions of German. We might, however, lower our sights still further and try to describe only the mixed declension, taking the

other two declensions as given. This restriction won't help (IIIb), however, since the counterexample to it in the previous paragraph involved the mixed declension. So we abandon the fight against redundancy and constrict the field of battle against ambiguity by two-thirds:

- (IV) A German NP A with CGN values I, a determiner of Class III, and a prenominal adjective must contain inflectional material M sufficient to make A phonologically distinct from any NP having CGN values I', where I and I' are different CGN values that receive phonologically distinct exponents for at least one form class of German.

Incredibly enough, even though (IV) has a tiny domain, there is at least one type of counterexample, illustrated by the MASC NP meinen grossen Flicker 'my large patch(es)', which is ambiguous between ACC SG and DAT PL. I conclude that further contention is pointless, and declare the characteristic-exponent proposal vanquished.

Undoubtedly, the language exhibits some tendency towards characteristic exponents, and it is utterly reasonable that it should do so (otherwise, there would be no function for the inflectional apparatus of adjectives to perform and it should wither away over the generations--as, in fact, in some dialects of German it has). But there is no rule enforcing characteristic exponents.

3.6. The status of these proposals

What if one of these proposals had turned out actually to describe the facts of German? They are all generalizations about the surface forms of NPs in German. And powerful generalizations at that, for they are transderivational in character (they require that different paradigms be compared, rather than that one structure, or even one derivation for that structure, be examined) and also refer to phonology, morphology, and syntax all at once (they are sensitive to the phonological identity of inflectional affixes within a particular syntactic constituent type).

On both grounds, they could not possibly be encoded in GPSG (meta)rules: clearly, neither derivational nor transderivational reference is possible in the framework I sketched in section 2; and, as Pullum and Zwicky (1984) point out, reference to phonology is also out of the range of a GPSG syntax. Even in a transformational framework they would be extraordinary: transderivational constraints have not found wide acceptance in such frameworks, and it was proposed as long ago as Zwicky (1969) that reference to phonology in transformational rules should be prohibited. That is, there are good reasons for supposing that even if a principle like (I)-(IV) had turned out to be correct, it would not function

as a condition on the application of a syntactic rule.

If such a principle is to be any sort of grammatical generalization, it must be a surface filter, a condition on the surface form of NPs in German. Such an analysis would be possible in a transformational framework, but at first glance it would appear to be inconsistent with GPSG. Certainly, the GPSG program does not countenance negative conditions, that is to say filters, in addition to its positive conditions, that is to say its phrase structure rules; the only negative statement about syntactic structure in GPSG is the (universal) final clause of a recursive definition: nothing is a phrase structure rule except by virtue of this definition. In any case, the transderivational and phonological nature of (III) would eliminate it as a candidate for a filter even in an extension of GPSG that embraced negative conditions.

However, there are arguments (alluded to in Zwicky (1983), developed in Zwicky and Pullum (forthcoming)) that surface filters apply not to syntactic surface structure, but rather to a level of morphophonological representation, namely the output of rules of allomorphy. As a theory of syntax, GPSG says nothing directly about phonology, although it has some indirect consequences for phonological theory (see Pullum and Zwicky (1984) on the Principle of Superficial Constraints in Phonology). Surface filters referring to phonology and morphology, even with transderivational power, are not ruled out in principle. A generalization like (I)-(IV) might then have a natural place as a surface filter.

But even this is not to be. Consider why surface filters are posited in the first place. In Perlmutter's original presentation (1971), a surface filter eliminates a configuration arising from the operation of several different rules (either separately or in interaction with one another). The rules are then permitted to apply without restriction, and the filter applies to the outputs resulting from the full set of rules.

In the German case we have been examining, the rules in question would include those distributing the values of adjective declension (S, W, and W-MX), those distributing the values of determiner class (I, II, and III), and allomorphy rules spelling out combinations of CGN values with declension class as particular endings. In a filter analysis, the declension class values would be freely distributed with respect to the determiner class values; endings would be freely distributed as exponents of the CGN/declension values; and (finally) principles like (I)-(IV) would act to eliminate distributions of endings which were either ambiguous or redundant.

Unfortunately, such principles just can't do enough work. There are many ways of achieving an unambiguous, nonredundant distribution of endings, given the available stock of them. A principle like (I)-(IV) cannot predict the particular distribution of endings German exhibits; these must, at least in part, be listed as the exponents of particular CGN/declension values.

3.7. An adequate description of the mixed declension

Although (IV) is inadequate as a generalization about German NPs and could not predict the actual endings of German NPs even if it had happened to be adequate, it can serve as the germ for an analysis of the allomorphy side of the phenomenon.

The key is to treat the weak and strong declensions as truly 'given' when the mixed declension allomorphs are being realized. I will assume that allomorphy rules say (a) for adjectives, what the phonological realization is for any CGN/declension combination if the value of DECL is S or W; and (b) for determiners, what the phonological realization is for any CGN/declension combination. Some of these allomorphy rules are generalizations, not mere spellings-out. One says that the ACC SG MASC (S or W) is -en, and another that the default for the ACC SG is to be identical to the NOM SG. One says that the NOM SG W ending is -e, and another that the default for W is -en. And so on.

What remains is to account for the mixed-declension endings on the basis of the endings in the other two declensions. The mixed declension of adjectives (Table 3) differs from the weak declension (Table 2) in only two respects, NOM SG MASC and NOM/ACC SG NEUT, which have the endings -er and -es, respectively, both drawn from the strong declension (Table 1). These are all the places, and the only places, where Class III determiners (which condition the mixed declension) have zero endings. The following generalization, which mentions neither ambiguity nor redundancy, is then true for German:

- (V) The ending of an adjective in the mixed declension is chosen from the strong paradigm if the preceding determiner has a zero ending, otherwise from the weak paradigm.

Principle (V) actually predicts what the mixed-declension endings are, and it does so correctly, but it is still not a trouble-free allomorphy rule. It refers to the makeup of a word adjacent to the one whose inflectional apparatus is being described, and it refers to (phonological) zero. The reference to the internal composition of other words is, I believe, unparalleled in a rule of allomorphy.

However, we can take a clue from the description above of where the weak ending *-e* occurs, and reformulate (V) entirely in terms of word-internal morphological properties:

- (VI) The ending of an adjective in the mixed declension is chosen from the strong paradigm in the non-FEM^s NOM SG, otherwise from the weak paradigm.

Rule (VI) covers the NOM SG MASC and NOM SG NEUT occurrences of *-e* directly. It covers the ACC SG NEUT by virtue of the assumption (above) that the default for the ACC SG ending is to be identical to the NOM SG, and this instruction is not countermanded by any other statement. It does not cover the ACC SG MASC, because this ending is explicitly specified (above, again) as *-en*.

The allomorphy rule (VI) accounts correctly for the forms of the mixed paradigm on the basis of those in the strong and weak paradigms, and it does so without extravagant theoretical moves. There are many details to be worked out; in particular, the mechanisms of default setting need attention, as do those that have the effect of setting one ending identical to another. But so long as the declension values S, W, and W-MX are distributed correctly in phrase structures, allomorphy rules along the lines of (VI) can describe the morphological exponents of CGN values.

A final note: A reasonably explicit formulation of (VI) can be constructed, given the assumptions of section 3.0. What (VI) says is that something with a category *C* not distinct from {CAT:A, BAR:0, HEAD:{AGR:{CASE:{DBL:-, GOV:-}, GEND:{F:-}, NUM:-}}, DECL:{WK:+, MX:+}} takes endings identical to those for category *C'*, where *C'* is derived from *C* by changing the value of DECL to {WK:-, MX:-}. The rule does not have to say that the weak paradigm is the default case; this is an automatic consequence of treating the mixed declension as a subtype of the weak declension, a decision made back in section 1.1 and formalized via the property WK:+ in section 3.0.

4. Analyzing the German adjective declensions in GPSG

Two potential mechanisms for describing the relationship between determiner subtypes and adjective declensions were presented in section 2: subcategorization of adjectives with respect to determiners (which I consider in section 4.1) and property agreement via the CAP and HFC (which I consider in section 4.2). The first is unsuitable for the case in hand, and the second turns out not to be available.

In section 4.3 I present an analysis in which this aspect of German adjective 'agreement' is in fact treated as government. The analysis is built around two principles in the metagrammar for German, Declension Government and

Declension Inheritance, though a number of other principles and default settings must be made explicit if the workings of these two are to be understood. The analysis also gives rise to some general questions about the description of government in GPSG, briefly surveyed in section 4.4.

4.1. Subcategorization

I turn now to the question of how to describe the implicational relationship between the determiner Class values I, II, and III and the adjective Declension values S, W, and W-MX. In line with the discussion of the preceding section, I take describing this relationship to be the only aspect of adjective declension in German that syntactic rules are responsible for; everything else is a matter of morphology and rules of allomorphy.

One mechanism GPSG provides for describing relationships between properties of nodes is subcategorization (by rule index; see section 2.8). A lexical category introduced in a rule is subcategorized with respect to the other constituents introduced by the same rule. The rule NP \rightarrow Det Nom introduces the lexical category Det. Accordingly, determiners can be lexically marked as to whether they occur with Nom as their only sister under NP (there might be other rules introducing Det as a daughter of NP).

For our purposes, the subcategorization mechanism determines things in the wrong direction: the category Det is subcategorized by Nom, rather than the other way around. The property determined by the subcategorization mechanism is the wrong one: occurrence with Nom in general, rather than occurrence with Nom of the subtype S, W, or W-MX. And the node subcategorizing Det is the wrong one: Nom rather than its daughter A. Even if we wanted to have Det subcategorized by A, rather than the other way around, we would have to deal with the fact that Det and A are not sister nodes, hence cannot affect one another directly in GPSG.

The only subcategorization analysis that I can construct has Declension S, Declension W, and Declension W-MX as properties of A which must be duplicated as properties of the Nom node above A; then these properties subcategorize Det. Three things are peculiar about this analysis. First, it must treat the strong/weak/mixed distinction as lexically associated with adjectives; but the distinction is not lexical at all. Second, some parochial rule must insure that these properties of A are duplicated as properties of Nom; neither the HFC nor the FFP can be called on, since the properties in question surely are not on the UHPL or the UFPL. Third, the rule introducing Nom and Det as sisters must explicitly mention these properties of Nom, if subcategorization is to be invoked. This analysis can be made to work, but it is eminently unsuitable.

4.2. Agreement

Another mechanism that might be appealed to is the one provided by the CAP and the HFC working together. However, this is completely unavailable, because the CAP and HFC can apply only to properties on the UHPL, and such parochial properties as Class II and Declension S are certainly not on that list, given that they seem to have no semantic correlates at all.

In fact, the PAR of section 2.6 prohibits even language-particular (meta)rules requiring property agreement, so that we are not free to construct an agreement account specifically for German.

(The use of the HFC would be odd even if the properties in question were on the UHPL. The Head Feature Convention would function to distribute within phrases properties that were not realized morphologically on the heads of those phrases; a head noun doesn't show any sort of morphological indication of the class of its determiner. Cooper (to appear) argues that the HFC should not be permitted to apply to such 'silent features'.)

Suppose we abandoned the requirement that properties figuring in the CAP be on the UHPL. We would still be unable to use the CAP to ensure that the declension properties are correctly distributed in German NPs. If the CAP is to say that 'the form of a functor depends on properties of its argument expression' (Bach 1983: 70), as GP clearly intend it to,⁷ then the determination of declension class runs in the wrong direction--Det is certainly the functor, Nom the argument expression, but the form of Nom depends on properties of Det--and the CAP is inapplicable.

Things are no better if, noting that the determiner class properties are associated with specific lexical items, we attempt to treat properties like Class II as foot properties rather than head properties, and so appeal to the FFP. Class II is no more likely to be on the UFPL than on the UHPL, and even if we gave up the UFPL, the FFP would only require that Class II on Det be duplicated as Class II on NP; it would not ensure that Class II, or some reflex of it, appeared on A.

4.3. Government

The analysis I opt for here is built on an observation made in section 1.4: Determiners of Classes I, II, and III require declension S, declension W, and declension W-MX, respectively, in their associated adjectives, but belong themselves to an Indeclinable set, declension S-ES, and

declension S-ES-Z, respectively.

This is no sort of agreement.⁹ Rather, a lexical class cleavage in the determiners is projected onto the adjectives as differences in inflection. 'The form of an argument depends on properties of the functor', as Bach (1983: 70) has it in his delineation of government. To put it yet another way, in agreement the head of a construction determines the form of a modifier, while in government a modifier determines the form of the head (see Zwicky 1984: sec. 2 for further discussion). The part of German adjective agreement that involves the determination of declension class is not agreement at all, but rather government.

What the syntax of German must say is that determiners of Class I impose the S declension on a following adjective, that determiners of Class II impose the W declension, and that determiners of Class III impose the W-MX declension. In a GPSG framework, this cannot be done in one step, since Det and A are not coconstituents. Recall the discussion in section 2.5: Det and Nom are coconstituents under NP, Nom branches into AP and N, AP branches into A', and A' branches into A. Two different principles are called for, one imposing properties on Nom by virtue of properties belonging to Det, the other propagating these properties 'down' from Nom, eventually to A. I will call these principles Declension Government (DG) and Declension Inheritance (DI), respectively.

Both of these principles belong to the metagrammar. DG acts as a rider on the branching of NP into Det plus Nom, DI as a rider on any branching of a category X into some set of categories, one of which is AP, A', or A--that is, one of which has the property CAT:A. Formulating the latter is straightforward:

Declension Inheritance: If category X has a daughter category Y with the property CAT:A, then X and Y must have identical values for the attribute DECL.

DI is reminiscent of the HFC; both require identity of certain properties between AP and A', and between A' and A. But it could not be collapsed with the HFC even if properties with the attribute DECL were on the UHPL, for the HFC does not require property identity between Nom and its modifier daughter AP, and the DI does.

Formulating DG is a trickier business, and requires some use of the formalism developed in section 3.0, because the exact shape DG takes will depend on how the default values for WK and MX in DECL are chosen; DG need mention only properties of Nom that have nondefault values, all remaining properties being filled in by default. For WK, at least, there is fairly clear evidence about the default. Recall from section 1.1 that the strong declension of adjectives is

used both with invariable determiners like zwei 'two' and also with a zero determiner, as in the mass NP braunes Bier 'brown beer' (NOM/ACC) and the plural NP brauner Buecher 'of brown books' (GEN). The natural analysis for such NPs is that they have no Det, not that they have determiners whose phonological realizations are null; certainly the null-determiner analysis would require justification. If there is a branching of NP into only one daughter, Nom, then there is no Det to govern an adjective declension in this construction, and the adjective declension that appears there must be the default. It follows that WK has the default value -. As for MX, I will assume that it too has a - default:

Defaults for DECL: In any category with the property CAT:A, the default value for WK and MX in DECL is -.

The task of DG is then to say when Nom has the properties WK:+ and MX:+. The first property is predictable from the fact that Det is declinable, the second from the fact that Det is an ein word:

Declension Government: In a branching of NP into Det and Nom, if Det has the property INDC:- then Nom has the property WK:+ in its value for DECL; and if Det has the property EIN:+ then Nom has the property MX:+ in its value for DECL.

With these formulations of DG and DI, the main part of my description of the German adjective declensions is finished. There are still some details worth discussing, having to do with the fact that German adjectives are sometimes declined, sometimes indeclinable.

The large generalization about this phenomenon is that adjectives are declined only when they are prenominal; I will disregard further details here. We need to describe the contrast between Die Frau ist klug 'The woman is wise', with the undeclined adjective form klug, and die kluge Frau 'the wise woman', with a declined form. The attribute in question is INDC, which I will say has the default value + ('indeclinable') for adjectives. This default is overridden within a prenominal AP, that is, within an AP that is the daughter of Nom.

An additional wrinkle comes in the fact that there are some reasons (not the least being their inflectional paradigms) for grouping the open classes of adjectives and nouns together with the closed classes of personal pronouns and determiners, at least in German; and the default value of INDC for all of these classes except the adjectives is certainly -. The natural property for these four groups of lexical items to share is the property N:+, in the system that GP provide for the analysis of the major word-class properties N (= {N:+, V:-}), A (= {N:+, V:+}), V (= {N:-,

V:+}), and P (= {N:-, V:-}). Putting all of these observations about declinability together, we have the two following principles:

Prenominal Adjectives: AP as a daughter of Nom has the property INDC:-.

Defaults for INDC: The default value for INDC is + for categories with the property CAT:A. The default value for INDC is - for categories with the property CAT:{N:+}.

The value settings run through three levels here: INDC for an AP daughter of Nom has the value -, overriding the default + value for categories with the property CAT:A, which in turn overrides the default - value for categories with the property CAT:{N:+}.

Two important issues having to do with the attribute INDC remain. The first is that values of INDC and DECL are distributed independently of one another by the principles above, but they are of course not independent. Indeed, as things stand free instantiation would allow both the appearance of DECL in a predicate adjective, where it would get a default value of {WK:-, MX:-}, and a default assignment of INDC:+ to the same predicate adjective; the latter ought to prevent the former. The second, closely related, problem is that the Prenominal Adjectives principle above assigns INDC a - value only at the AP level, but the place where INDC does its real work is at the A level, where it determines whether or not rules of allomorphy realize properties of words as inflectional affixes; free instantiation of INDC should be prevented from assigning INDC:+ to an A dominated by an AP with the property INDC:-. Another inheritance principle could be stated, but it would solve only the second problem. Both problems can be solved by preventing free instantiation--in the first case, of DECL (with any value) in a predicate adjective having the property INDC:+; in the second, of INDC (with the value +) in a prenominal adjective having any value for DECL. The following principle does the trick:

Declinability: A category has the property INDC:+ if and only if it has no property with the attribute DECL.

This principle connects a property determining the applicability of some set of morphological rules with a property that (in effect) picks out the applicable rule. The connection is obviously not a matter of German grammar, but a universal generalization about systems of properties.

This completes the sketch of the syntactic side of adjective agreement in German. Two universal metagrammatical principles, the HFC and CAP, require that the case, gender, and number properties of N or NP be duplicated on a prenominal adjective. Two principles of the metagrammar for

German, DG and DI, in concert with default settings and two principles involving INDC (one parochial, one universal), ensure that the adjective has the declension property appropriate to its context.

A syntactic analysis along these lines ought to be constructible regardless of the sort of morphological analysis it is destined to be combined with. The details will vary with the morphological framework, of course, and there is no denying that my analysis is tailored to a specific view of inflectional morphology. In this view, inflectional morphology describes the way in which (bundles of) morphosyntactic properties of words are realized as affixes (or morphological processes, which I have not dealt with here). The primary descriptive tool is the rule of allomorphy, which either assigns phonological content to the properties or refers the assignment to another combination of properties (as when the assignment for the ACC SG is referred to that for the NOM SG, or when the assignment for the mixed declension is referred to that for the strong declension under certain conditions). Like my syntactic analysis, this approach to inflectional morphology relies heavily on principles (some of them rather complex) giving default assignments, with competition between principles resolved in favor of the more specific principle (as when the assignment for the ACC SG MASC overrides the assignment for the ACC SG).⁹

4.4. On the analysis of government in GPSG

I move now to wider issues concerning government and its analysis in a GPSG framework, which I will approach by observing some differences in the phenomena to be analyzed.

GPSG permits the description of two different sorts of phenomena falling under the traditional heading of government: what I will call 'vertical government' and 'horizontal government'. In vertical government a category has a property by virtue of appearing as a daughter of some specified category. In horizontal government, the familiar type, a category has a property by virtue of appearing as a sister of some specified category.

Vertical government can be illustrated by English prenominal possessives like this evening's in this evening's events. These can be analyzed as NP determiners, with the CASE:GEN property supplied in the rule licensing the branching of Det into a lone NP. Thus, the NP has this property by virtue of appearing as a daughter of Det, rather than S, VP, or PP. A similar analysis might be entertained for nominative NPs in English, if it is assumed that CASE:ACC is the default assignment for CASE, so that it is the task of some syntactic rule(s) of English to say where CASE:NOM occurs. On these assumptions, the CASE:NOM property would be

supplied in the rule licensing the branching of S into NP and VP. The NP would have this property by virtue of appearing as the daughter of S, rather than Det, VP, or PP.

A horizontal-government treatment of the nominative case is also available, of course, and it is indistinguishable from the vertical-government treatment unless either (a) NP and VP can be sisters under some category other than S, or (b) NP and some category other than VP can be sisters under S (or NP can appear as the sole daughter of S). Failing that, both analyses simply say that S can branch into a VP and an NP with the property CASE:NOM. If (a) or (b) holds, then the possibility arises that vertical and horizontal government can be distinguished, and also that an instance of government should be described not in a rule but in the metagrammar, as a generalization across all rules of a certain type. That is, it might be that NP has the property CASE:NOM in any rule licensing it as a daughter of S. Or that NP has this property in any rule licensing it as a sister of VP.

Note, furthermore, that in standard examples of horizontal government the governing category is a lexical category. Verbs and prepositions, for instance, govern particular cases of their object NPs. If the relationship between a complementizer and the S it combines with is viewed as government of the S by the complementizer (so that that governs a finite S, for an infinitive S, wh-words a slashed finite S, etc.), then this too is horizontal government with a lexical category serving as the governor. So there is some question as to whether a horizontal-government analysis of nominative case should be available, since the governing category would be the phrasal category VP.

In some instances of horizontal government, the governing category is not only lexical, but also at least in part arbitrary. In languages in which verbs or prepositions can govern several different cases, for instance, it is typical that one cannot predict, on the basis of their syntactic or semantic properties, exactly which items govern a nondefault case; the class of governors is partly arbitrary. This is certainly true for the German verbs and prepositions governing the DAT or GEN rather than the default ACC. And it is true for the German determiners governing declension properties, as I observed in section 1.2.

An important difference between case government and declension government in German is that in the former the determined properties (with the attribute CASE) are on the UHPL, but in the latter the determined properties (with the attribute DECL) are parochial. As one result of this difference, the determined properties in the former example (but not the latter) participate in agreement via the HFC and CAP.

Another result of this difference is that the former phenomena, but not the latter, have an alternative analysis that is not, speaking intuitively at least, government. A horizontal-government analysis of DAT and GEN case-marking in German says: In a branching of VP into V and NP (and possibly other categories), if V has the property SUBCLASS:X then NP has the property CASE:DAT, and if V has the property SUBCLASS:Y then NP has the property CASE:GEN. In the alternative, a rule schema permits the NP in such a branching to occur with any one of the properties CASE:ACC, CASE:DAT, or CASE:GEN, and V is then subcategorized according to these properties. The alternative makes the analysis of case-marking in German entirely parallel to the subcategorization of English verbs according to whether they occur with various types of objects (one NP, two NPs, one NP plus a PP in to, one NP plus a PP in for, etc.).

Let me now pull some of these analytic threads together. What lies behind the preceding discussion is a concern that the theory of grammar should constrain government in much the same way that it constrains agreement. Can horizontal government be restricted to instances with a lexical category as governor? (If so, then nominative case-marking in English must be vertical government.) Or to instances with parochial governed categories? (If so, then the subcategorization analysis is the only one available for object case-marking in German, in which case the phenomenon is not treated by the grammar as government in a strict sense.) Can metarules for vertical government be prohibited? (If so, then vertical government disappears as a substantive notion in GPSG, since it is then merely the appearance of some property on a daughter category specified by a rule and is indistinguishable from a simple instance of horizontal government.)

I do not know what the answers to these questions are, though I am inclined to suppose that they are all positive. Certainly the questions are worth further investigation.

Notes

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1. There are principles governing which endings are identical to which others. For instance: for all gender/number combinations except masculine singular, the accusative is identical to the nominative. See section 3.7 for further development of this idea.

2. The definite article has idiosyncratic allomorphy in the nominative and accusative forms: wherever des would be expected in these forms, das occurs instead, and wherever de would be expected in these forms, die occurs instead. (As it happens, des does occur where expected in the genitive.) These facts about allomorphy do not affect the syntactic generalizations to be made.

3. The variation between -es and -s in the genitive singular of masculine and neuter nouns in Tables 6 and 8 is phonologically conditioned, and will not concern us here. Similarly, the variation between -e and zero in the dative singular of masculine and neuter nouns is phonologically and stylistically conditioned, and will not concern us here.

4. Listing the HFC, CAP, and FFP does not preclude the existence of other general principles governing the distribution of features in constituent structures. Indeed, Gazdar, Klein, Sag, and Pullum (1982) entertain an analysis of conjunction in which the feature CONJ, neither a head nor a foot feature, obeys its own (universal) principles of occurrence.

5. In Lapointe's scheme, there are no syntactic rules of agreement, hence no 'grammatical agreement' in the usual sense. Instead, agreement facts are supposed to fall out from a well-formedness condition on Logical Form plus the well-formedness condition on S-structures.

6. Note that in the system of property values adopted in section 3.0, the non-FEM genders constitute a natural class, namely the class of categories with the property GEND:{F:-}.

7. The version of the CAP that GP give is completely symmetrical and does not in itself reflect any logical directionality in the relationship between the determinans and determinatum in grammatical agreement.

8. Nor any sort of disagreement rule, which is what Lapointe suggests on the basis of a simplified set of paradigms.

9. This exploitation of a generalized Proper Inclusion Precedence, or 'elsewhere', condition on morphological rules it shares with lexical, or level-ordered, morphology (see Kiparsky 1982 and the references therein), with which it is not in principle inconsistent.

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